

6.3 REQUIREMENT ALLOCATION MATRIX

Section 6.3.1 - Requirements traceability Matrix; L-7 DMR Reqts to IAS 3.2 Element Specifications

L7 DMR Req.	L7 DMR Requirements Summary	IAS 3.2 Element Spec.
6400.01	IAS shall perform the principal functions of receiving and processing data, performing calibrations, evaluating performance, and management	3.2.1.1.1 3.2.1.1.2
6400.02	IAS shall receive and process Landsat 7 data.	3.2.1.1.2, 3.2.2.6.4 3.2.2.3.1 - 3.2.2.3.5 3.2.2.7.5
6400.02.01	IAS shall retrieve level OR products and associated metadata from the EDC-DAAC.	3.2.1.1.1
6400.02.02	IAS shall process level OR data to produce radiometrically and geometrically corrected level 1R and 1G images.	3.2.2.3.1 - 3.2.2.3.5 3.2.2.3.7 - 3.2.2.3.11 3.2.2.3.15, 3.2.2.3.16
6400.02.03	IAS shall generate up to 10 ETM+ Level 1R or 1G subintervals systematically corrected scenes per day.	3.2.3.14, 3.2.3.15 3.2.3.16
6400.02.04	IAS shall create and maintain a library of receive and archive geodetic control point data and digital elevation model data.	3.2.2.6.5, 3.2.2.6.6 3.2.2.3.12, 3.2.3.13 3.2.3.21, 3.2.3.22
6400.02.05	IAS shall remove image artifacts while processing level OR data to produce level 1R images as required.	3.2.2.3.13, 3.2.2.3.14 3.2.2.5.2
6400.02.06	IAS shall produce products compatible with the standard specified in the L-7 Program Coordinate Systems Standard.	
6400.02.07	The IAS shall receive a FDF generated definitive ephemeris from the MOC , covering the last 7 days, once per week.	Created. 3.2.1.3.7

6400.02.08	The IAS shall be capable of assessing on a sample basis the quality of ETM+ Level OR products archived by the EDC-DAAC.	3.2.2.4.1, 3.2.2.4.3 3.2.2.4.12, 3.2.2.4.15
6400.03	IAS shall perform radiometric and geometric calibrations on selected L-7 data.	3.2.2.1.1, 3.2.2.1.2 3.2.2.1.8, 3.2.2.2.1 3.2.2.2.4, 3.2.3.12 3.2.4.8
6400.03.01	IAS shall calibrate the absolute radiometric response (abs. spectral rad.) of each operable ETM+ detector to the specified accuracy.	3.2.2.1.1, 3.2.2.1.2 3.2.2.1.3, 3.2.2.1.4 3.2.2.1.5, 3.2.3.1
6400.03.02	IAS shall calibrate the relative radiometric response (rel. spectral rad.) of each operable ETM+ detector to the specified accuracy.	3.2.2.1.1, 3.2.2.1.2 3.2.2.1.3, 3.2.2.1.4 3.2.2.1.5
6400.03.03	IAS shall determine and update calibration coefficients.	3.2.2.1.7, 3.2.2.1.8
6400.03.04	IAS shall determine the stability of the satellite's on-board calibration sources.	3.2.2.1.6
6400.03.05	IAS shall determine misalignment between the satellite navigational base reference and the ETM+ line of sight.	3.2.2.2.1, 3.2.3.12
6400.03.06	IAS shall determine the ETM+ field angle knowledge, determine scan mirror profiles and assess band-to-band alignment.	3.2.2.2.2
6400.03.07	The IAS shall be capable of calibrating along and across scan parameters.	3.2.2.2.3 3.2.3.6
6400.04	IAS shall evaluate the performance of the satellite, instrument, and ground processing procedures with respect to image radiometry and geometry, and temporal registration.	3.2.2.3.6, 3.2.2.4.8 3.2.2.4.9, 3.2.2.4.10 3.2.2.4.11

6400.04.01	IAS shall evaluate L-7 system performance with respect to radiometric response and operability of each ETM+ detector, signal to noise ratio, and system modulation transfer function for each spectral band.	3.2.2.3.14, 3.2.2.4.4 3.2.2.4.5, 3.2.2.4.6 3.2.2.4.7, 3.2.4.8
6400.04.02	IAS shall determine the absolute radiometric accuracy of Level 1 ETM+ data, and the geometric accuracy of Level 1G ETM+ data.	3.2.2.4.2, 3.2.2.4.8 3.2.2.4.9 - 3.2.2.4.11 3.2.3.1, 3.2.3.3- 3.2.3.11
6400.04.03	IAS shall assess the degree of streaking, banding, scan-line droop, coherent noise, correlated noise, and any artifacts discovered following launch.	3.2.2.4.3, 3.2.2.4.14
6400.04.04	IAS shall monitor and perform long-term trend analyses of system performance and image quality.	3.2.2.4.13
6400.04.05	need requirement for determining relative radiometric accuracy	3.2.3.2
6400.05	IAS shall manage the collection, dissemination, and storage of data related to IAS activities, and ensure that the calibration and assessment procedures of the L-7 Science Quality Assurance Team are correctly executed.	3.2.2.6.2, 3.2.2.6.5 3.2.2.6.6, 3.2.2.6.7 3.2.2.6.8, 3.2.2.6.9 3.2.2.6.10, 3.2.2.6.11
6400.05.01	IAS shall send calibration coefficient updates, problem reports, data quality assessments, and processing parameters and associated metadata to the EDC-DAAC.	3.2.1.1.3, 3.2.1.1.4 3.2.3.17, 3.2.3.18
6400.05.02	IAS shall provide processing parameters, data quality assessments, and problem reports to the LPS, as specified in the LPS-IAS ICD.	3.2.1.2.1, 3.2.1.2.2 3.2.1.2.4

6400.05.03	IAS shall receive satellite and instrument performance data from the MOC, and coordinate with the MOC for the acquisition of ETM+ image data required for image quality assessment.	3.2.1.3.1, 3.2.1.3.2 3.2.1.3.6
6400.05.04	IAS shall send problem reports, status reports, data quality assessments, and calibration updates to the MOC.	3.2.1.3.3, 3.2.1.3.4 3.2.1.3.5, 3.2.2.7.1
6400.05.05	IAS shall incorporate new algorithms as required to improve the radiometric and geometric properties of ETM+ data and their assessment.	3.2.2.5.1, 3.2.2.5.3 3.2.4.9
6400.05.06	IAS shall maintain an archive of its product calibration data and correction parameters.	3.2.2.6.3, 3.2.2.6.7 3.2.2.6.11, 3.2.3.20
6400.05.07	IAS shall produce calibration , data quality and system performance assessment reports.	3.2.2.7.1, 3.2.2.7.3 3.2.2.7.4, 3.2.3.17 3.2.3.19
6400.05.08	Need interface requirement with LPS to deal with reprocessing requests	3.2.1.2.1 - 3.2.1.2.3 (modified)
6400.05.09	Need interface requirement with MMO for exchange of reports	3.2.1.4.1
6400.06	The IAS shall satisfy the performance and operational requirements of the L-7 system specification.	3.2.4.4

6.3.3 Requirements Traceability Matrix: IAS 3.2 Element Specifications to IAS 3.7 Element Specifications.

IAS 3.2 REQs	IAS 3.2 ELEMENT SPECIFICATIONS SUMMARY	IAS 3.7 REQs
3.2.1 Interface Requirements (EDC-DAAC, LPS, MOC, MMO)		
3.2.1.1.1	The IAS shall interface with the EDC-DAAC for purposes of searching for and ordering of data from the Landsat 7 archive.	3.7.1.1 3.7.1.2 3.7.1.5
3.2.1.1.2	The IAS shall receive Level OR Data and Level OR Products and associated ancillary/metadata from the EDC-DAAC.	3.7.1.2 3.7.1.11
3.2.1.1.3	The IAS shall interface with the EDC-DAAC to coordinate the transfer of calibration parameter files and IAS generated reports.	3.7.1.2 3.7.1.19
3.2.1.1.4	The IAS shall electronically send calibration parameter files, IAS generated reports, and their respective metadata to the EDC-DAAC.	3.7.1.2
3.2.1.2.1	The IAS shall interface with the LPS to coordinate the transfer of calibration parameter files and reprocessing requests.	3.7.1.1 3.7.1.3
3.2.1.2.2	The IAS shall send reprocessing requests to the LPS.	3.7.1.3
3.2.1.2.3	The IAS shall receive disposition of reprocessing requests from the LPS.	3.7.1.3
3.2.1.2.4	The IAS shall send calibration parameter files to the LPS.	3.7.1.3
3.2.1.3.1	The IAS shall provide to the MOC a schedule for the operational acquisition of partial aperture calibration data, full aperture calibration data, and surface image data of radiometric and geometric calibration ground sites	3.7.1.4
3.2.1.3.2	The IAS shall coordinate with the MOC for the acquisition of additional ETM+ imagery required for calibration and image assessment.	3.7.1.1 3.7.1.4

3.2.1.3.3	The IAS shall interface with the MOC to coordinate the transfer of problem reports, and calibration parameter files.	3.7.1.1 3.7.1.4
3.2.1.3.4	The IAS shall send problem reports to the MOC.	3.7.1.4
3.2.1.3.5	The IAS shall electronically send calibration parameter files and calibration requests to the MOC.	3.7.1.4
3.2.1.3.6	The IAS shall be capable of receiving trend reports and spacecraft status reports from the MOC.	3.7.1.4
3.2.1.3.7	The IAS shall be capable of receiving FDF generated definitive ephemeris from the MOC.	3.7.1.4 3.7.2.15
3.2.1.4.1	The IAS shall send problem reports and summary reports to the Mission Management Office.	3.7.1.6 3.7.1.1
3.2.2 Functional Requirements		
3.2.2.1 Radiometric Calibration		
3.2.2.1.1	The IAS shall be able to utilize data from the internal calibrator in the calibration of the radiometric response of each ETM+ detector.	3.7.3.6
3.2.2.1.2	The IAS shall be able to calibrate the radiometric response of each ETM+ detector, except band 6, using data from the partial aperture solar calibrator.	3.7.3.1
3.2.2.1.3	The IAS shall be able to calibrate the radiometric response of each ETM+ detector, except band 6, using data from the full aperture solar calibrator.	3.7.3.2
3.2.2.1.4	The IAS shall be able to calibrate the radiometric response of each ETM+ detector given Level OR data of a ground calibration site and corresponding at-aperture spectral radiance values.	3.7.3.3
3.2.2.1.5	The IAS shall be able to calibrate the radiometric response of each ETM+ detector using level OR data from pre-ship and pre-launch calibration sources and auxiliary calibration source data.	3.7.3.5

3.2.2.1.6	The IAS shall have the capability of assessing the short and long-term stability of the on-board calibration sources which include the full aperture solar calibrator, partial aperture solar calibrator, and the internal calibrators.	
3.2.2.1.7	The IAS shall be able to integrate the results of the various calibration processes into an optimal estimate of radiometric calibration of each detector (except band 6) and provide new calibration parameters.	3.7.3.4
3.2.2.1.8	The IAS shall be capable of generating radiometric calibration updates.	3.7.1.19
3.2.2.1.9	The IAS shall be able to transfer the calibration of each detector to the internal calibrator.	3.7.3.7
<u>3.2.2.2 Geometric Calibration</u>		
3.2.2.2.1	The IAS shall be capable of determining the misalignment between the satellite navigational base reference and the ETM+ payload line-of-sight.	3.7.4.2
3.2.2.2.2	The IAS shall be capable of determining band to band registration parameters.	
3.2.2.2.3	The IAS shall be capable of characterizing and updating along and across scan parameters (i.e. scan mirror profiles, scan corrected mirror profile, detector offsets, detector delays).	3.7.2.12 3.7.4.3 - 3.7.4.5
3.2.2.2.4	The IAS shall be capable of generating geometric calibration updates.	3.7.1.19
<u>3.2.2.3 Level 1 Processing</u>		
3.2.2.3.1	The IAS shall be capable of processing PCD data.	3.7.1.17, 3.7.1.15 3.7.2.6
3.2.2.3.2	The IAS shall be capable of processing ETM+ Level OR products to produce radiometrically corrected Level 1R image data.	3.7.2.1 - 3.7.2.4

3.2.2.3.3	The IAS shall be capable of creating systematically corrected ETM+ Level 1G imagery from level OR products.	3.7.2.6 - 3.7.2.9 3.7.2.15
3.2.2.3.4	The IAS shall be capable of creating precision corrected ETM+ Level 1G imagery from level OR products and ground control points.	3.7.2.13, 3.7.2.14
3.2.2.3.5	The IAS shall be capable of creating terrain corrected ETM+ Level 1G imagery from level OR products, ground control points, and elevation data.	3.7.2.16
3.2.2.3.6	The IAS shall be capable of performing image to image registration.	
3.2.2.3.7	The IAS shall be capable of incorporating IAS generated calibration coefficient updates to generate Level 1 data.	3.7.2.5
3.2.2.3.8	The IAS shall support nearest neighbor, cubic convolution, and MTF compensation resampling.	3.7.2.10 3.7.2.11
3.2.2.3.9	The IAS shall have the capability to produce a 1G product with a grid cell size that is continuously variable from 15 to 60 meters.	3.7.2.7 3.7.2.9
3.2.2.3.10	The IAS shall have the capability to map project 1G using the Space Oblique Mercator, Universal Transverse Mercator, Lambert Conformal Conic, Transverse Mercator, Oblique Mercator, and Polyconic coordinate reference systems.	3.7.2.17
3.2.2.3.11	The IAS shall have the capability to create a 1G image oriented to nominal path or north-up	3.7.2.18
3.2.2.3.12	The IAS shall be capable of receiving and archiving GCPs and GCP chips	3.7.4.1 needs modificatio n
3.2.2.3.13	The IAS shall be capable of compensating for inoperable detectors during level 1R and 1G processing.	3.7.2.4

3.2.2.3.14	The IAS shall be capable of compensating for image artifacts including but not limited to streaking, banding, and pan coherent noise during level 1R and 1G processing	3.7.2.2 - 3.7.2.4 3.7.5.2
3.2.2.3.15	The IAS shall be capable of processing to Level 1R and 1G both ascending and descending pass ETM+ Level OR data	
3.2.2.3.16	The IAS shall be capable of processing non-nominal data (e.g. backwards time jumps, data gaps).	
<u>3.2.2.4 Performance Evaluation</u>		
3.2.2.4.1	The IAS shall evaluate the on-orbit operability of ETM+ detectors.	3.7.5.7
3.2.2.4.2	The IAS shall be able to evaluate the absolute radiometric accuracy of ETM+ Level OR, 1R and 1G data.	
3.2.2.4.3	The IAS shall be able to assess identified ETM+ radiometric image artifacts including but not limited to streaking, banding, correlated and coherent noise, scan line droop, and bright target recovery response	3.7.5.3 - 3.7.5.5 3.7.5.9
3.2.2.4.4	The IAS shall be able to evaluate the MTF of each ETM+ detector.	3.7.5.6
3.2.2.4.5	The IAS shall be able to evaluate the signal to noise ratio of each ETM+ detector, utilizing pre-launch and on-orbit image data.	3.7.5.7
3.2.2.4.6	The IAS shall be capable of evaluating the on-orbit radiometric response of each ETM+ detector with respect to dynamic range.	
3.2.2.4.7	The IAS shall be capable of evaluating the on-orbit radiometric response of each ETM+ detector excluding band 6 with respect to linearity (TBD)	
3.2.2.4.8	The IAS shall be able to evaluate the geodetic accuracy of ETM+ Level 1G image data.	3.7.2.14 3.7.6.4

3.2.2.4.9	The IAS shall be able to evaluate the internal geometric accuracy of ETM+ Level 1G image data.	3.7.2.14
3.2.2.4.10	The IAS shall be able to evaluate the band to band registration accuracy of ETM+ imagery.	3.7.2.14 3.7.6.1
3.2.2.4.11	The IAS shall be able to evaluate the image to image registration accuracy of ETM+ data.	3.7.2.14 3.7.6.3
3.2.2.4.12	The IAS shall be able to evaluate the quality of level OR products. Quality checks will include but not be limited to those listed in Table 3.2.2.4-1.	
3.2.2.4.13	The IAS shall be capable of performing a trend analysis over any desired time interval for each selected evaluation activity.	3.7.7.2
3.2.2.4.14	The IAS shall be capable of performing (and/or supporting) other anomaly, assessment, resolution, and reporting.	
3.2.2.4.15	The IAS shall provide the capability to visually inspect image data.	3.7.7.5
3.2.2.4.16	The IAS shall provide a capability that allows an image analyst to monitor assessment processes and results.	3.7.1.10
3.2.2.4.17	The IAS shall have the capability to review output data including but not limited to calibration reports and updates.	
<u>3.2.2.5 Incorporation of New Algorithms</u>		
3.2.2.5.1	The IAS shall have the capability to acquire, develop, test, and add new algorithms and software to improve the radiometric and geometric properties of ETM+ data and their assessment without impacting IAS operations.	3.7.1.21
3.2.2.5.2	The IAS shall support the development of algorithms to remove image artifacts and detector outages from Level 1R and 1G data.	
3.2.2.5.3	The IAS shall have the capability to incorporate new algorithms into the operational system.	3.7.1.21

3.2.2.5.4	The IAS shall maintain configuration control of all algorithms, databases, software, and hardware used in operations.	3.7.1.21 3.7.1.22
<u>3.2.2.6 Control Processes and Manage Data</u>		
3.2.2.6.1	The IAS shall be capable of executing a set of processes defined as procedures (job control)	
3.2.2.6.2	The IAS shall be capable of archiving all software and databases used in operations	
3.2.2.6.3	The IAS shall be capable of storing selected data, parameters, reports, and documents.	3.7.1.13 3.7.1.14
3.2.2.6.4	The IAS shall have the ability to monitor and control processes and procedures.	3.7.1.9. 3.7.1.10 3.7.1.20, 3.7.1.23
3.2.2.6.5	The IAS shall be capable of storing selected GCPs, GCP chips, and associated metadata.	3.7.1.14
3.2.2.6.6	The IAS shall be capable of receiving and storing selected DEMs.	3.7.1.14
3.2.2.6.7	The IAS shall be capable of archiving selected online data, parameters, and ancillary data.	3.7.1.13
3.2.2.6.8	The IAS shall be capable of receiving and storing solar spectral and broadband radiance data from external sources.	3.7.1.14
3.2.2.6.9	The IAS shall be capable of receiving and storing sun radiance data from external sources	3.7.1.14
3.2.2.6.10	The IAS shall be capable of receiving and storing cross calibration data from other sensors.	3.7.1.14
3.2.2.6.11	The IAS shall archive selected pre-launch data including but not limited to sensor engineering, ETM+ image data, alignment matrices, calibration measurements, mirror scan profiles, FASC BRDF, relative spectral sub-system response on a detector by detector basis, and required characterization data for performing in-flight calibrations	3.7.1.14

<u>3.2.2.7 Report and Summaries</u>		
3.2.2.7.1	The IAS shall generate calibration, data quality assessment, and problems reports for the various interfaces.	3.7.7.1
3.2.2.7.2	The IAS shall be capable of generating metadata for all reports sent to the EDC-DAAC.	
3.2.2.7.3	The IAS shall generate annual reports that document calibration coefficient and performance analysis trends.	
3.2.2.7.4	The IAS shall generate reports of anomaly detection analyses as they appear.	
3.2.2.7.5	The IAS shall generate processing summaries after each IAS activity.	
<u>3.2.3 Performance Requirements</u>		
<u>Accuracy</u>		
3.2.3.1	The IAS shall be capable of calibrating the radiometric response (absolute spectral radiance) of each operable ETM+ detector to an accuracy of 5%, 1 sigma, providing all inputs are within specification.	
3.2.3.2	The IAS shall be capable of calibrating the relative radiometric response such that the ratio of ETM+ equivalent at-aperture radiances between any combination of two spectral bands, excluding band 6, shall vary less than 2%, 1 sigma, over a 7 day period when exposed to a spectrally constant source.	
3.2.3.2	The IAS shall be capable of calibrating the relative radiometric response such that the ratio of ETM+ equivalent at-aperture radiances between any combination of two spectral bands, excluding band 6, shall vary less than 2%, 1 sigma, over a 7 day period when exposed to a spectrally constant source.	
3.2.3.3	The IAS shall contribute no greater than .7% uncertainty to absolute radiometric accuracy during the generation of level 1R and 1G data.	

3.2.3.4	The IAS shall be able to create systematic imagery to a geodetic accuracy of 250 meters, 1 sigma, providing all inputs are within specification. Performance applies to along-track and cross-track directions, and is referenced to a nadir-viewing geometry.	
3.2.3.5	The Level 1 Processor shall contribute circular errors no greater than 1.8 m, 1 sigma, in the production of systematically corrected ETM+ Level 1G imagery. This error is referenced to a nadir viewing geometry and excludes the effect of terrain correction.	
3.2.3.6	The IAS shall provide the capability to register pixels from a band to the corresponding pixels of the other bands in a common scene to an accuracy of 0.28 sensor GSD, .9p, in along-track and cross-track directions providing all inputs are within specification. The accuracy is relative to the largest sensor GSD of the registered bands.	3.7.6.2
3.2.3.7	The Level 1 Processor shall contribute error no greater than .11 multispectral sensor GSD, .9p, along-track, and .24 multispectral sensor GSD, .9p, cross-track in the assessment of band-to-band registration.	
3.2.3.8	The IAS shall provide the capability to perform image to image registration to an accuracy of 0.4 multispectral sensor GSD, .9p, in the along-track and cross-track directions providing all inputs are within specification.	
3.2.3.9	The Level 1 Processor shall contribute circular errors no greater than 3.6 m, 1 sigma, during image to image registration correction of ETM+ Level 1G data. Error is referenced to a nadir viewing geometry and excludes the effect of terrain correction	

3.2.3.10	The IAS shall be capable of estimating the field angles to an accuracy of .18 arcsec, 1 sigma.	
3.2.3.11	The IAS shall be capable of digitally correlating common features in separate bands of the same image or same bands of separate images to an accuracy of 0.1 pixel, .9p.	
3.2.3.12	The IAS shall be capable of estimating the alignment of the ETM+ line-of-sight to the satellite navigation base reference to an accuracy of 24 arcsec, 1 sigma, in all axes.	
Throughput		
3.2.3.14	The IAS shall be capable of generating the equivalent of up to 10 ETM+ Level 1R or 10 1G systematically precision-corrected scenes in an 8 hour day over the life of the mission.	
3.2.3.15	The IAS shall be capable of receiving and storing up to 10 GB per day of data from the EDC-DAAC.	3.7.1.11
3.2.3.16	The IAS shall be capable of archiving a total of 20,000 Landsat-7 Level OR equivalent scenes over the life of the mission.	3.7.1.13
3.2.3.17	The IAS shall generate monthly reports that document the quality of OR data and OR products retrieved from the EDC-DAAC.	
3.2.3.18	The IAS shall provide regular calibration and performance updates to the EDC-DAAC and other interfaces on a quarterly basis.	3.7.1.19
3.2.3.19	The IAS shall provide an annual Landsat-7 image quality report.	
3.2.3.20	The IAS shall have an online data storage capacity of 100 GB (TBR)	
3.2.3.21	The IAS shall be capable of storing GCP data (points, chips, metadata) of at least 68 MB.	
3.2.3.22	The IAS shall be capable of archiving 20 GB of elevation data.	

3.2.4 Operational Requirements		
3.2.4.1	The IAS shall be staffed with an operator, two image analysts, software maintenance personnel, and an IAS manager (TBR).	
3.2.4.2	The IAS shall support end-to-end testing at least 12 (TBR) months prior to launch.	
3.2.4.3	The IAS shall be capable of supporting full operations at launch -6 months	
3.2.4.4	The IAS shall support mission operations for a minimum of 5 years following in-orbit check-out (IOC).	
3.2.4.5	The IAS shall operate two shifts for seven days a week during IOC plus 48 days (TBR)	
3.2.4.6	The IAS shall be staffed during prime shift post IOC plus 48 days (TBR).	
3.2.4.7	The IAS shall ensure backup of all online data and operations software	
3.2.4.8	The IAS shall perform calibrations, assessments and evaluations with frequencies specified in Tables 3.2.4-1 and 3.2.4-2.	
3.2.4.9	The IAS shall have the capability to maintain and upgrade all operational software	
3.2.4.10	The IAS shall be capable of supporting training without impacting daily work loads.	
3.2.4.11	The IAS shall provide an Operational Availability of 0.85 (TBR) or better for all processing functions .	
3.2.4.12	The IAS shall support a mean time to restore (MTTR) capability of 12 (TBR) hours or better.	

6.3.3 Requirements Traceability Matrix: IAS 3.2 Element Specifications to IAS 3.7 Element Specifications.

IAS 3.2 REQs	IAS 3.2 ELEMENT SPECIFICATIONS SUMMARY	IAS 3.7 REQs
3.2.1 Interface Requirements (EDC-DAAC, LPS, MOC, MMO)		
3.2.1.1.1	The IAS shall interface with the EDC-DAAC for purposes of searching for and ordering of data from the Landsat 7 archive.	3.7.1.1 3.7.1.2 3.7.1.5
3.2.1.1.2	The IAS shall receive Level OR Data and Level OR Products and associated ancillary/metadata from the EDC-DAAC.	3.7.1.2 3.7.1.11
3.2.1.1.3	The IAS shall interface with the EDC-DAAC to coordinate the transfer of calibration parameter files and IAS generated reports.	3.7.1.2 3.7.1.19
3.2.1.1.4	The IAS shall electronically send calibration parameter files, IAS generated reports, and their respective metadata to the EDC-DAAC.	3.7.1.2
3.2.1.2.1	The IAS shall interface with the LPS to coordinate the transfer of calibration parameter files and reprocessing requests.	3.7.1.1 3.7.1.3
3.2.1.2.2	The IAS shall send reprocessing requests to the LPS.	3.7.1.3
3.2.1.2.3	The IAS shall receive disposition of reprocessing requests from the LPS.	3.7.1.3
3.2.1.2.4	The IAS shall send calibration parameter files to the LPS.	3.7.1.3
3.2.1.3.1	The IAS shall provide to the MOC a schedule for the operational acquisition of partial aperture calibration data, full aperture calibration data, and surface image data of radiometric and geometric calibration ground sites	3.7.1.4
3.2.1.3.2	The IAS shall coordinate with the MOC for the acquisition of additional ETM+ imagery required for calibration and image assessment.	3.7.1.1 3.7.1.4

3.2.1.3.3	The IAS shall interface with the MOC to coordinate the transfer of problem reports, and calibration parameter files.	3.7.1.1 3.7.1.4
3.2.1.3.4	The IAS shall send problem reports to the MOC.	3.7.1.4
3.2.1.3.5	The IAS shall electronically send calibration parameter files and calibration requests to the MOC.	3.7.1.4
3.2.1.3.6	The IAS shall be capable of receiving trend reports and spacecraft status reports from the MOC.	3.7.1.4
3.2.1.3.7	The IAS shall be capable of receiving FDF generated definitive ephemeris from the MOC.	3.7.1.4 3.7.2.15
3.2.1.4.1	The IAS shall send problem reports and summary reports to the Mission Management Office.	3.7.1.6 3.7.1.1
3.2.2 Functional Requirements		
3.2.2.1 Radiometric Calibration		
3.2.2.1.1	The IAS shall be able to utilize data from the internal calibrator in the calibration of the radiometric response of each ETM+ detector.	3.7.3.6
3.2.2.1.2	The IAS shall be able to calibrate the radiometric response of each ETM+ detector, except band 6, using data from the partial aperture solar calibrator.	3.7.3.1
3.2.2.1.3	The IAS shall be able to calibrate the radiometric response of each ETM+ detector, except band 6, using data from the full aperture solar calibrator.	3.7.3.2
3.2.2.1.4	The IAS shall be able to calibrate the radiometric response of each ETM+ detector given Level OR data of a ground calibration site and corresponding at-aperture spectral radiance values.	3.7.3.3
3.2.2.1.5	The IAS shall be able to calibrate the radiometric response of each ETM+ detector using level OR data from pre-ship and pre-launch calibration sources and auxiliary calibration source data.	3.7.3.5

3.2.2.1.6	The IAS shall have the capability of assessing the short and long-term stability of the on-board calibration sources which include the full aperture solar calibrator, partial aperture solar calibrator, and the internal calibrators.	
3.2.2.1.7	The IAS shall be able to integrate the results of the various calibration processes into an optimal estimate of radiometric calibration of each detector (except band 6) and provide new calibration parameters.	3.7.3.4
3.2.2.1.8	The IAS shall be capable of generating radiometric calibration updates.	3.7.1.19
3.2.2.1.9	The IAS shall be able to transfer the calibration of each detector to the internal calibrator.	3.7.3.7
<u>3.2.2.2 Geometric Calibration</u>		
3.2.2.2.1	The IAS shall be capable of determining the misalignment between the satellite navigational base reference and the ETM+ payload line-of-sight.	3.7.4.2
3.2.2.2.2	The IAS shall be capable of determining band to band registration parameters.	
3.2.2.2.3	The IAS shall be capable of characterizing and updating along and across scan parameters (i.e. scan mirror profiles, scan corrected mirror profile, detector offsets, detector delays).	3.7.2.12 3.7.4.3 - 3.7.4.5
3.2.2.2.4	The IAS shall be capable of generating geometric calibration updates.	3.7.1.19
<u>3.2.2.3 Level 1 Processing</u>		
3.2.2.3.1	The IAS shall be capable of processing PCD data.	3.7.1.17, 3.7.1.15 3.7.2.6
3.2.2.3.2	The IAS shall be capable of processing ETM+ Level OR products to produce radiometrically corrected Level 1R image data.	3.7.2.1 - 3.7.2.4

3.2.2.3.3	The IAS shall be capable of creating systematically corrected ETM+ Level 1G imagery from level OR products.	3.7.2.6 - 3.7.2.9 3.7.2.15
3.2.2.3.4	The IAS shall be capable of creating precision corrected ETM+ Level 1G imagery from level OR products and ground control points.	3.7.2.13, 3.7.2.14
3.2.2.3.5	The IAS shall be capable of creating terrain corrected ETM+ Level 1G imagery from level OR products, ground control points, and elevation data.	3.7.2.16
3.2.2.3.6	The IAS shall be capable of performing image to image registration.	
3.2.2.3.7	The IAS shall be capable of incorporating IAS generated calibration coefficient updates to generate Level 1 data.	3.7.2.5
3.2.2.3.8	The IAS shall support nearest neighbor, cubic convolution, and MTF compensation resampling.	3.7.2.10 3.7.2.11
3.2.2.3.9	The IAS shall have the capability to produce a 1G product with a grid cell size that is continuously variable from 15 to 60 meters.	3.7.2.7 3.7.2.9
3.2.2.3.10	The IAS shall have the capability to map project 1G using the Space Oblique Mercator, Universal Transverse Mercator, Lambert Conformal Conic, Transverse Mercator, Oblique Mercator, and Polyconic coordinate reference systems.	3.7.2.17
3.2.2.3.11	The IAS shall have the capability to create a 1G image oriented to nominal path or north-up	3.7.2.18
3.2.2.3.12	The IAS shall be capable of receiving and archiving GCPs and GCP chips	3.7.4.1 needs modification
3.2.2.3.13	The IAS shall be capable of compensating for inoperable detectors during level 1R and 1G processing.	3.7.2.4

3.2.2.3.14	The IAS shall be capable of compensating for image artifacts including but not limited to streaking, banding, and pan coherent noise during level 1R and 1G processing	3.7.2.2 - 3.7.2.4 3.7.5.2
3.2.2.3.15	The IAS shall be capable of processing to Level 1R and 1G both ascending and descending pass ETM+ Level OR data	
3.2.2.3.16	The IAS shall be capable of processing non-nominal data (e.g. backwards time jumps, data gaps).	
<u>3.2.2.4 Performance Evaluation</u>		
3.2.2.4.1	The IAS shall evaluate the on-orbit operability of ETM+ detectors.	3.7.5.7
3.2.2.4.2	The IAS shall be able to evaluate the absolute radiometric accuracy of ETM+ Level OR, 1R and 1G data.	
3.2.2.4.3	The IAS shall be able to assess identified ETM+ radiometric image artifacts including but not limited to streaking, banding, correlated and coherent noise, scan line droop, and bright target recovery response	3.7.5.3 - 3.7.5.5 3.7.5.9
3.2.2.4.4	The IAS shall be able to evaluate the MTF of each ETM+ detector.	3.7.5.6
3.2.2.4.5	The IAS shall be able to evaluate the signal to noise ratio of each ETM+ detector, utilizing pre-launch and on-orbit image data.	3.7.5.7
3.2.2.4.6	The IAS shall be capable of evaluating the on-orbit radiometric response of each ETM+ detector with respect to dynamic range.	
3.2.2.4.7	The IAS shall be capable of evaluating the on-orbit radiometric response of each ETM+ detector excluding band 6 with respect to linearity (TBD)	
3.2.2.4.8	The IAS shall be able to evaluate the geodetic accuracy of ETM+ Level 1G image data.	3.7.2.14 3.7.6.4

3.2.2.4.9	The IAS shall be able to evaluate the internal geometric accuracy of ETM+ Level 1G image data.	3.7.2.14
3.2.2.4.10	The IAS shall be able to evaluate the band to band registration accuracy of ETM+ imagery.	3.7.2.14 3.7.6.1
3.2.2.4.11	The IAS shall be able to evaluate the image to image registration accuracy of ETM+ data.	3.7.2.14 3.7.6.3
3.2.2.4.12	The IAS shall be able to evaluate the quality of level OR products. Quality checks will include but not be limited to those listed in Table 3.2.2.4-1.	
3.2.2.4.13	The IAS shall be capable of performing a trend analysis over any desired time interval for each selected evaluation activity.	3.7.7.2
3.2.2.4.14	The IAS shall be capable of performing (and/or supporting) other anomaly, assessment, resolution, and reporting.	
3.2.2.4.15	The IAS shall provide the capability to visually inspect image data.	3.7.7.5
3.2.2.4.16	The IAS shall provide a capability that allows an image analyst to monitor assessment processes and results.	3.7.1.10
3.2.2.4.17	The IAS shall have the capability to review output data including but not limited to calibration reports and updates.	
<u>3.2.2.5 Incorporation of New Algorithms</u>		
3.2.2.5.1	The IAS shall have the capability to acquire, develop, test, and add new algorithms and software to improve the radiometric and geometric properties of ETM+ data and their assessment without impacting IAS operations.	3.7.1.21
3.2.2.5.2	The IAS shall support the development of algorithms to remove image artifacts and detector outages from Level 1R and 1G data.	
3.2.2.5.3	The IAS shall have the capability to incorporate new algorithms into the operational system.	3.7.1.21

3.2.2.5.4	The IAS shall maintain configuration control of all algorithms, databases, software, and hardware used in operations.	3.7.1.21 3.7.1.22
<u>3.2.2.6 Control Processes and Manage Data</u>		
3.2.2.6.1	The IAS shall be capable of executing a set of processes defined as procedures (job control)	
3.2.2.6.2	The IAS shall be capable of archiving all software and databases used in operations	
3.2.2.6.3	The IAS shall be capable of storing selected data, parameters, reports, and documents.	3.7.1.13 3.7.1.14
3.2.2.6.4	The IAS shall have the ability to monitor and control processes and procedures.	3.7.1.9. 3.7.1.10 3.7.1.20, 3.7.1.23
3.2.2.6.5	The IAS shall be capable of storing selected GCPs, GCP chips, and associated metadata.	3.7.1.14
3.2.2.6.6	The IAS shall be capable of receiving and storing selected DEMs.	3.7.1.14
3.2.2.6.7	The IAS shall be capable of archiving selected online data, parameters, and ancillary data.	3.7.1.13
3.2.2.6.8	The IAS shall be capable of receiving and storing solar spectral and broadband radiance data from external sources.	3.7.1.14
3.2.2.6.9	The IAS shall be capable of receiving and storing sun radiance data from external sources	3.7.1.14
3.2.2.6.10	The IAS shall be capable of receiving and storing cross calibration data from other sensors.	3.7.1.14
3.2.2.6.11	The IAS shall archive selected pre-launch data including but not limited to sensor engineering, ETM+ image data, alignment matrices, calibration measurements, mirror scan profiles, FASC BRDF, relative spectral sub-system response on a detector by detector basis, and required characterization data for performing in-flight calibrations	3.7.1.14

<u>3.2.2.7 Report and Summaries</u>		
3.2.2.7.1	The IAS shall generate calibration, data quality assessment, and problems reports for the various interfaces.	3.7.7.1
3.2.2.7.2	The IAS shall be capable of generating metadata for all reports sent to the EDC-DAAC.	
3.2.2.7.3	The IAS shall generate annual reports that document calibration coefficient and performance analysis trends.	
3.2.2.7.4	The IAS shall generate reports of anomaly detection analyses as they appear.	
3.2.2.7.5	The IAS shall generate processing summaries after each IAS activity.	
<u>3.2.3 Performance Requirements</u>		
<u>Accuracy</u>		
3.2.3.1	The IAS shall be capable of calibrating the radiometric response (absolute spectral radiance) of each operable ETM+ detector to an accuracy of 5%, 1 sigma, providing all inputs are within specification.	
3.2.3.2	The IAS shall be capable of calibrating the relative radiometric response such that the ratio of ETM+ equivalent at-aperture radiances between any combination of two spectral bands, excluding band 6, shall vary less than 2%, 1 sigma, over a 7 day period when exposed to a spectrally constant source.	
3.2.3.2	The IAS shall be capable of calibrating the relative radiometric response such that the ratio of ETM+ equivalent at-aperture radiances between any combination of two spectral bands, excluding band 6, shall vary less than 2%, 1 sigma, over a 7 day period when exposed to a spectrally constant source.	
3.2.3.3	The IAS shall contribute no greater than .7% uncertainty to absolute radiometric accuracy during the generation of level 1R and 1G data.	

3.2.3.4	The IAS shall be able to create systematic imagery to a geodetic accuracy of 250 meters, 1 sigma, providing all inputs are within specification. Performance applies to along-track and cross-track directions, and is referenced to a nadir-viewing geometry.	
3.2.3.5	The Level 1 Processor shall contribute circular errors no greater than 1.8 m, 1 sigma, in the production of systematically corrected ETM+ Level 1G imagery. This error is referenced to a nadir viewing geometry and excludes the effect of terrain correction.	
3.2.3.6	The IAS shall provide the capability to register pixels from a band to the corresponding pixels of the other bands in a common scene to an accuracy of 0.28 sensor GSD, .9p, in along-track and cross-track directions providing all inputs are within specification. The accuracy is relative to the largest sensor GSD of the registered bands.	3.7.6.2
3.2.3.7	The Level 1 Processor shall contribute error no greater than .11 multispectral sensor GSD, .9p, along-track, and .24 multispectral sensor GSD, .9p, cross-track in the assessment of band-to-band registration.	
3.2.3.8	The IAS shall provide the capability to perform image to image registration to an accuracy of 0.4 multispectral sensor GSD, .9p, in the along-track and cross-track directions providing all inputs are within specification.	
3.2.3.9	The Level 1 Processor shall contribute circular errors no greater than 3.6 m, 1 sigma, during image to image registration correction of ETM+ Level 1G data. Error is referenced to a nadir viewing geometry and excludes the effect of terrain correction	

3.2.3.10	The IAS shall be capable of estimating the field angles to an accuracy of .18 arcsec, 1 sigma.	
3.2.3.11	The IAS shall be capable of digitally correlating common features in separate bands of the same image or same bands of separate images to an accuracy of 0.1 pixel, .9p.	
3.2.3.12	The IAS shall be capable of estimating the alignment of the ETM+ line-of-sight to the satellite navigation base reference to an accuracy of 24 arcsec, 1 sigma, in all axes.	
Throughput		
3.2.3.14	The IAS shall be capable of generating the equivalent of up to 10 ETM+ Level 1R or 10 1G systematically precision-corrected scenes in an 8 hour day over the life of the mission.	
3.2.3.15	The IAS shall be capable of receiving and storing up to 10 GB per day of data from the EDC-DAAC.	3.7.1.11
3.2.3.16	The IAS shall be capable of archiving a total of 20,000 Landsat-7 Level OR equivalent scenes over the life of the mission.	3.7.1.13
3.2.3.17	The IAS shall generate monthly reports that document the quality of OR data and OR products retrieved from the EDC-DAAC.	
3.2.3.18	The IAS shall provide regular calibration and performance updates to the EDC-DAAC and other interfaces on a quarterly basis.	3.7.1.19
3.2.3.19	The IAS shall provide an annual Landsat-7 image quality report.	
3.2.3.20	The IAS shall have an online data storage capacity of 100 GB (TBR)	
3.2.3.21	The IAS shall be capable of storing GCP data (points, chips, metadata) of at least 68 MB.	
3.2.3.22	The IAS shall be capable of archiving 20 GB of elevation data.	

3.2.4 Operational Requirements		
3.2.4.1	The IAS shall be staffed with an operator, two image analysts, software maintenance personnel, and an IAS manager (TBR).	
3.2.4.2	The IAS shall support end-to-end testing at least 12 (TBR) months prior to launch.	
3.2.4.3	The IAS shall be capable of supporting full operations at launch -6 months	
3.2.4.4	The IAS shall support mission operations for a minimum of 5 years following in-orbit check-out (IOC).	
3.2.4.5	The IAS shall operate two shifts for seven days a week during IOC plus 48 days (TBR)	
3.2.4.6	The IAS shall be staffed during prime shift post IOC plus 48 days (TBR).	
3.2.4.7	The IAS shall ensure backup of all online data and operations software	
3.2.4.8	The IAS shall perform calibrations, assessments and evaluations with frequencies specified in Tables 3.2.4-1 and 3.2.4-2.	
3.2.4.9	The IAS shall have the capability to maintain and upgrade all operational software	
3.2.4.10	The IAS shall be capable of supporting training without impacting daily work loads.	
3.2.4.11	The IAS shall provide an Operational Availability of 0.85 (TBR) or better for all processing functions .	
3.2.4.12	The IAS shall support a mean time to restore (MTTR) capability of 12 (TBR) hours or better.	

6.3.4 Requirements Traceability Matrix: IAS 3.7 Element Specifications to IAS 3.2 Element Specifications

IAS 3.7 Elem. Spec.	IAS 3.7 Elem. Specifications Summary	IAS 3.2 Elem. Spec.
Control Processes and Manage Data (CPMD)		
3.7.1.1	CPMD shall have a telephone capability for interface coordination with the EDC-DAAC, LPS, MOC, and MMO.	3.2.1.1.1, 3.2.1.4.1 3.2.1.2.1 3.2.1.3.2, 3.2.1.3.3
3.7.1.2	CPMD shall interface with the EDC-DAAC as described in the Interface Control Document Between the IAS and ECS and the Landsat 7 System, 209-CD-013-002.	3.2.1.1.1 - 3.2.1.1.5
3.7.1.3	CPMD shall interface with the LPS as described in the Interface Control Document Between the IAS and the LPS, 514-1/CD/O195	3.2.1.2.1 - 3.2.1.2.4
3.7.1.4	CPMD shall interface with the MOC as described in the Landsat 7 MOC to IAS Interface Control Document, #....	3.2.1.3.1 - 3.2.1.3.7
3.7.1.5	CPMD shall have the capability to perform as interactive dialog search of the EDC-DAAC archive.	3.2.1.1.1
3.7.1.6	CPMD shall have the capability to send reports to the MMO	3.2.1.4.1
3.7.1.7	CPMD shall have the capability to predict Landsat 7 orbit paths and sun angles.	
3.7.1.8	CPMD shall define the image processing parameters IAS will use for processing Level OR scenes, after receipt of the scenes from the EDC-DAAC.	
3.7.1.9	CPMD shall perform planning and scheduling of IAS tasks and resources.	3.2.2.6.1 3.2.2.6.4
3.7.1.10	CPMD shall be capable of detecting, handling, and logging system and data errors.	3.2.2.6.4 3.2.2.4.16
3.7.1.11	CPMD shall be capable of receiving, retrieving, and ingesting OR product data from EDC-DAAC.	3.2.1.1.2 3.2.3.15

3.7.1.12	CPMD shall be capable of receiving, retrieving, and ingesting OR product data from the LPS.	Need new DMR, L-7 s.spec., and IAS 3.2
3.7.1.13	CPMD shall have the ability to save, identify, list, search, and retrieve all data items and parameters generated by the IAS.	3.2.2.6.3, 3.2.2.6.7 3.2.3.15 3.2.3.16
3.7.1.14	CPMD shall be capable of receiving and archiving pre-launch, elevation, GCP, cross calibration, ground look, sun radiance, solar spectral and broadband radiance data from external sources.	3.2.2.6.3 3.2.2.6.5 - 3.2.2.6.6 3.2.2.6.8 - 3.2.2.6.11
3.7.1.15	CPMD shall be capable of correcting OR product data times for on-board clock drifts.	
3.7.1.16	CPMD shall be capable of extracting and validating FHSERR, SHSERR, scan direction and start times from the Mirror Scan Correction Data (MSCD).	
3.7.1.17	CPMD shall be capable of validating and converting to engineering units, the Payload Correction Data (PCD).	3.2.2.3.1
3.7.1.18	CPMD shall be capable of validating scene coordinates.	
3.7.1.19	CPMD shall generate and maintain a calibration parameter file for distribution to the LPS, EDC-DAAC, and the MOC.	3.2.2.2.4, 3.2.3.18 3.2.1.1.3, 3.2.2.1.8
3.7.1.20	CPMD shall monitor IAS system status and IAS processing status.	3.2.2.6.4
3.7.1.21	CPMD shall be capable of updating, testing and releasing IAS software as needed	3.2.2.5.1 3.2.2.5.3 - 3.2.2.5.4
3.7.1.22	CPMD shall maintain configuration control of all algorithms, databases, software and hardware used in IAS operations.	3.2.2.5.4
3.7.1.23	CPMD shall interface with all other IAS components for monitoring processes and receiving status and data.	3.2.2.6.4

Process to Level 1 (PL1)

3.7.2.1	PL1 shall have the capability to logically relate the internal calibrator (IC) data by scan line, with image data received in the Level OR product.	3.2.2.3.2
3.7.2.2	PL1 shall have the capability to correct IC and image data for the effects of instrument memory effect.	3.2.2.3.2 3.2.2.3.14
3.7.2.3	PL1 shall have the capability to correct image data for the effects of scan correlated shift, coherent noise and impulse noise.	3.2.2.3.14 3.2.2.3.2
3.7.2.4	PL1 shall have the capability to correct image data for dropped lines, inoperable and saturated detectors, and the effects of striping and banding.	3.2.2.3.2 3.2.2.3.13 - 3.2.2.3.14
3.7.2.5	PL1 shall have the capability to apply radiometric calibration to the OR image data to produce 1R imagery.	3.2.2.3.7
3.7.2.6	PL1 shall have the capability to create a geometric model to relate PCD and MSCD to spacecraft position and pointing as a function of time.	3.2.2.3.1 3.2.2.3.3
3.7.2.7	PL1 shall have the capability to generate input grid functions.....with grid cell size variable.....or selectable	3.2.2.3.3 3.2.2.3.9
3.7.2.8	PL1 shall have the capability to calculate instrument line of sight and image latitudes and longitudes using the geometric model.	3.2.2.3.3
3.7.2.9	PL1 shall have the capability to generate a geometric grid for use in resampling.....	3.2.2.3.3 3.2.2.3.9
3.7.2.10	PL1 shall have the capability to resample using nearest neighbor, cubic convolution and MTF compensation.	3.2.2.3.8
3.7.2.11	PL1 shall have the capability to for operators/analysts to select the appropriate resampling method.	3.2.2.3.8
3.7.2.12	PL1 shall have the capability to resample imagery in the along scan direction only.	3.2.2.2.3
3.7.2.13	PL1 shall have the capability to correct the precision model used to generate 1G images.	3.2.2.3.4

3.7.2.14	PL1 shall have the capability to create precision corrected 1G images of geometric test sites.	3.2.2.3.4 3.2.2.4.8 - 3.2.2.4.11
3.7.2.15	PL1 shall have the capability to process images using either the ephemeris generated by the spacecraft and received in the PCD of each image, or the ephemeris calculated by the FDF and received from the MOC.	3.2.2.3.1 3.2.2.3.3 3.2.1.3.7
3.7.2.16	PL1 shall have the capability to correct 1G images of geometric test sites for terrain effects.	3.2.2.3.5
3.7.2.17	PL1 shall have the capability for operators/analysts to select the appropriate 1G map projections from the projections listed in 3.2.2.3.10.	3.2.2.3.10
3.7.2.18	PL1 shall have the capability for operators/analysts to select the 1G image orientation (either nominal path or north-up).	3.2.2.3.11
Perform Radiometric Calibration (PRC)		
3.7.3.1	PRC shall have the capability to process partial aperture solar calibrator (PASC) images, calculating dark values, solar values, and gain values for each detector, except for those in band 6.	3.2.2.1.2
3.7.3.2	PRC shall have the capability to process full aperture solar calibrator (FASC) images, calculating incident angles, reflected solar radiance, FASC bright values, and gains for each detector, except for those in band 6.	3.2.2.1.3
3.7.3.3	PRC shall have the capability to calibrate the radiometric responses of each ETM+ detector given Level OR data of a ground calibration site and corresponding at-aperture spectral radiance values.	3.2.2.1.4

3.7.3.4	PRC shall have the capability to integrate the results of the various calibration processes into an optimal estimate of radiometric calibration of each detector and provide new calibration parameters	3.2.2.1.7
3.7.3.5	PRC shall have the capability to process pre-launch image data, both reflective and emissive bands, to generate detector gains and biases.	3.2.2.1.5
3.7.3.6	PRC shall have the capability to process internal calibrator data of both the reflective and the emissive bands to generate detector gains and biases.	3.2.2.1.1
3.7.3.7	PRC shall have the capability to transfer the calibration of any of the ETM+ calibration sources to any source.	3.2.2.1.9 (partial)
Perform Geometric Calibration (PGC)		
3.7.4.1	PGC shall have the capability to receive GCPs from CPMD and process these data for geometric test sites.	3.2.2.3.12
3.7.4.2	PGC shall have the capability to determine the misalignment between the satellite navigational base reference and the ETM+ payload line-of-sight using GCPs for geometric test sites to calculate attitude angle changes to correct the precision model.	3.2.2.2.1
3.7.4.3	PGC shall have the capability to calculate detector delays and offsets in the along scan direction, to be included in the geometric processing parameters, using geometric test site images.	3.2.2.2.3
3.7.4.4	PGC shall have the capability to calculate detector offsets in the across scan direction.	3.2.2.2.3
3.7.4.5	PGC shall have the capability to calculate scan-line corrector mirror motion errors using geometric test site images.	3.2.2.2.3
Characterize Radiometry (CR)		

3.7.5.1	CR shall characterize data quality by locating and identifying impulse noise and dropped lines.	
3.7.5.2	CR shall characterize memory effect, a function of instrument quality, by estimating and validating a model of memory effect.	3.2.2.3.14
3.7.5.3	CR shall characterize scan correlated shifts, a function of instrument quality, by identifying state changes in a characterized image and measuring state levels by detector in night images.	3.2.2.4.3
3.7.5.4	CR shall characterize coherent noise, a function of instrument quality, by.....	3.2.2.4.3
3.7.5.5	CR shall identify and locate saturated detectors and characterize their effects.	3.2.2.4.3
3.7.5.6	CR shall characterize the instrument MTF.	3.2.2.4.4
3.7.5.7	CR shall calculate the SNR and determine the status of each detector (nominal, degraded or dead).	3.2.2.4.1 3.2.2.4.5
3.7.5.8	CR shall have the capability to characterize random noise of an image.	
3.7.5.9	CR shall have the capability to characterize the striping and banding of an image.	3.2.2.4.3
Characterize Geometry (CG)		
3.7.6.1	CG shall have the capability to calculate band-to-band registration accuracy, registration residuals, and detector field angles on systematically corrected 1G images.	3.2.2.4.10
3.7.6.2	CG shall have an automated correlation capability that will correlate to .2 pixel on average.	3.2.3.6
3.7.6.3	CG shall have the capability to calculate image to image registration accuracy of any two geometrically corrected images (of the same area).	3.2.2.4.11

3.7.6.4	CG shall have the capability to calculate the geodetic accuracy of geometrically corrected geometric test site images by using ground control points to determine location errors in the image.	3.2.2.4.8
Evaluation Performance (EP)		
3.7.7.1	EP shall have the capability to generate reports from data from all other components and from analyst inputs.	3.2.2.7.1
3.7.7.2	EP shall have the capability to trend data from all other components and the IAS archive.	3.2.2.4.13
3.7.7.3	EP shall have the capability to compare data items and parameters.	3.2.2.4.13
3.7.7.4	EP shall provide analysis tools to IAS analysts (e.g. FFT, histogramming, statistical tools, curve fitting, etc.)	3.2.2.4.1 - 3.2.2.4.17
3.7.7.5	EP shall have the capability to visually display images for inspection, rotate, zoom, resolution, refresh rate.....	3.2.2.4.15

6.3.5 Allocation of High Level IAS Requirements to DRMs, Landsat 7 System Specification, IAS 3.2 Element Specifications, Algorithms and Subsystems

Allocation of high level IAS requirements to the DMR, L-7 System Specification, 3.2 Element Specification, Algorithms and Subsystems

High Level Reqts.	DMR	Landsat 7 Sys.Spec.	IAS 3.2 Elem. Spec.	Algorithms
<u>Generate Geometric Calibration Parameters</u>				
Perform Geom.Calib.	6400.0 3	3.7.7.2.1.2, 3.7.7.2.2.1 3.7.7.2.2.2, 3.7.7.2.2.3	3.2.2.2.1 - 3.2.2.2.4	4.1-4.3 Perform Geom. Calibration
Sensor-S/C Alignment	6400.0 3.05	3.7.7.2.2.1, 3.7.7.4.5	3.2.2.2.1	4.1 Perform Sensor Alignment
Along-Scan Parm./Det	6400.0 3.07	3.7.7.2.2.2, 3.7.7.2.2.3	3.2.2.2.3, 3.2.2.2.2	4.2 Perform Along Scan Calibration
Across-Scan Parm./Det	6400.0 3.07	3.7.7.2.2.2, 3.7.7.2.2.3	3.2.2.2.3, 3.2.2.2.2	4.3 Perform Across Scan Calibration
<u>Generate Radiometric Calibration Parameters</u>				
Determ. Rad. Cal. Coef.	6400.0 3.03	3.7.7.2.1.2	3.2.2.1.7, 3.2.2.1.8	3.0 Perform Rad. Calibration
Process PASC	6400.0 3.01	3.7.7.2.1.1	3.2.2.1.2	3.1 Process Partial Aperture
Process FASC	6400.0 3.01	3.7.7.2.1.1	3.2.2.1.3	3.2 Process Full Aperture
<u>Update Calibr. Coeff.</u>	6400.0 3.03	3.7.7.2.1.2	3.2.2.1.7, 3.2.2.1.8 3.2.2.2.4	1.4.2 Manage Parameter File 4.1-4.3 Perform Geometric Calib. 3.0 Perform Rad. Calibration
<u>Evaluate/Assess System Performance</u>				
<u>Geometric Assessments:</u>				
Field angle knowledge	6400.0 3.06	3.7.7.2.2.2, 3.7.7.4.5	3.2.3.10	6.2 Char. Image/Image Reg.
Scan mirror profile	6400.0 3.06	3.7.7.2.2.2, 3.7.7.4.5	3.2.2.2.3	6.2. Char. Image/Image Reg.
Band/Band Align. (Reg)	6400.0 3.06 6400.0 3.07	3.7.7.2.2.2 3.7.7.2.2.3	3.2.2.2.2, 3.2.2.4.10	6.1 Char. Band/Band Reg.
Geodetic Accuracy	6400.0 4	3.7.7.2.4.6	3.2.2.4.8	6.3 Char. Geodetic Accuracy
Geometric Accuracy	6400.0 4	3.7.7.2.4.3	3.2.2.4.9	7.2 Visual Check

Image/Image Reg. Acc.	6400.0 4	3.7.7.2.4.8	3.2.2.4.11, 3.2.2.3.6	6.2 Char. Image/Image Reg.
<u>Evaluate/Assess System Performance</u>				
<u>Radiometric Assessments:</u>				
<u>Assess Radiometric Response</u>				
Detector Operability	6400.0 4.01	3.7.7.2.4.1	3.2.2.4.1	5.2.5 Char. Detector Operability
Detector Saturation (Dynamic Range)	6400.0 4.01	3.7.7.2.4.1, 3.7.7.2.4.4	3.2.2.4.6	5.2.4 Char. Detector Saturation
Evaluate MTF	6400.0 4.01	3.7.7.2.4.1	3.2.2.4.4	5.2.6 Char. MTF
Signal- to-Noise Ratio (SNR)	6400.0 4.01	3.7.7.2.4.1	3.2.2.4.5	5.3.1 Char. Random Noise
Linearity	6400.0 4.01	3.7.7.2.4.1	3.2.2.4.7	5.2.5.2 Char. Degraded Detectors
Memory Effect	6400.0 4.01	3.7.7.2.4.1	3.2.2.4.3	5.2.1 Char. Memory Effect
Char. Absolute Rad.	6400.0 4.02	3.7.7.2.1.1, 3.7.7.2.4.2	3.2.2.4.2, 3.2.3.1	5.2.5 Char. Detector Operability
Char. Relative Rad.	6400.0 3.02	3.7.7.3.3	3.2.3.2	5.3.3 Char. Relative Radiometry
<u>Assess Image Artifacts</u>				
Drop Line	6400.0 4.03	3.7.7.2.4.4	3.2.2.4.3	5.1.2 Char. Dropped Line
Impulse Noise	6400.0 4.03	3.7.7.2.4.4	3.2.2.4.3	5.1.1 Char. Impulse Noise
Correlated Noise (Scan-correlated Shift)	6400.0 4.01	3.7.7.2.4.4	3.2.2.4.3	5.2.2 Char. Scan-Correlate Shift
Coherent Noise	6400.0 4.03	3.7.7.2.4.4	3.2.2.4.3	5.2.3 Char. Coherent Noise
Random Noise (SNR)	6400.0 4.03	3.7.7.2.4.4	3.2.2.4.3	5.3.1 Char. Random Noise
Detector Saturation	6400.0 4.03	3.7.7.2.4.4	3.2.2.4.3	5.2.4 Char. Detector Saturation
Memory Effect (scan line droop; bright target recovery)	6400.0 4.03	3.7.7.2.4.4	3.2.2.4.3	5.2.1 Char. Memory Effect
Streaking, Banding	6400.0 4.03	3.7.7.2.4.4	3.2.2.4.3	5.3.3 Char. Relative Radiometry
<u>Evaluate Level OR data quality</u>				
Assess L- OR prod. qual.	6400.0 2.08	3.7.7.2.4.7	3.2.2.4.12	1.4.1.2.2 Validate Level-OR Product
Assess PCD (L-OR)	6400.0 2.08	3.7.7.2.4.7	3.2.2.3.1, 3.2.2.4.12	1.4.1.2.4 Process PCD 1.4.1.2.4.2 Validate PCD

Assess MSCD (L-OR)	6400.0 2.08	3.7.7.2.4.7	3.2.2.4.12	1.4.1.2.3 Process MSCD 1.4.1.2.3.6-.8 Validate MSCD
<u>Other IAS Operations:</u>				
Produce Level - 1R and Level IG data	6400.0 2.02	3.7.7.2.3.1, 3.7.7.2.3.2	3.2.2.3.2 - 3.2.2.3.5	2.0 Process Level 1
Create GCP/Elevation Data Library	6400.0 2.04	3.7.7.2.3.3, 3.7.7.2.3.4	3.2.2.3.12	1.4.1.3 Archive
Perf. Long-term Trend	6400.0 4.04	3.7.7.2.4.5	3.2.2.4.13	7.3 Trend Data
Create Reports	6400.0 5.07	3.7.7.2.7	3.2.2.7.1, 3.2.2.7.3	7.4 Generate Reports
Maintain archive	6400.0 5.06	3.7.7.2.6	3.2.2.6.3, 3.2.2.6.7 3.2.2.6.11	1.4 Manage Data 1.4.1.3 Archive
Send Calibration Parameters (LP-DAAC, LPS, and MOC)	6400.0 5.01 6400.0 5.02 6400.0 5.04	3.7.7.1.1.2 3.7.7.1.2.1 3.7.7.1.3.4	3.2.1.1.4 3.2.1.2.4 3.2.1.3.3	1.4.2 Manage Parameter 1.1.3 Coordinate with External
Send Problem Reports (LP-DAAC, LPS, MOC)	6400.0 5.01 6400.0 5.02 6400.0 5.04	3.7.7.1.1.3 3.7.7.1.2.1 3.7.7.1.3.1	3.2.1.1.4 3.2.1.2.2 3.2.1.3.3	1.1.3 Coordinate with External

6.4 Requirements Allocation to IAS Subsystems

6.4.1 IAS 3.2 Element Specification to IAS Subsystems Allocation

3.2 REQs	IAS 3.2 ELEMENT SPECIFICATIONS SUMMARY	C P M D	P L 1	R C A L	G C A L	R C H A	G C H A	E P E R
3.2.1 Interface Requirements (EDC-DAAC, LPS, MOC, MMO)								
3.2.1.1.1	The IAS shall interface with the EDC-DAAC for purposes of searching for and ordering of data from the Landsat 7 archive.	x						
3.2.1.1.2	The IAS shall receive Level OR Data and Level OR Products and associated ancillary/metadata from the EDC-DAAC.	x						
3.2.1.1.3	The IAS shall interface with the EDC-DAAC to coordinate the transfer of calibration parameter files and IAS generated reports.	x						
3.2.1.1.4	The IAS shall electronically send calibration parameter files, IAS generated reports, and their respective metadata to the EDC-DAAC.	x						
3.2.1.2.1	The IAS shall interface with the LPS to coordinate the transfer of calibration parameter files and reprocessing requests.	x						
3.2.1.2.2	The IAS shall send reprocessing requests to the LPS.	x						
3.2.1.2.3	The IAS shall receive disposition of reprocessing requests from the LPS.	x						
3.2.1.2.4	The IAS shall send calibration parameter files to the LPS.	x						

3.2.1.3.1	The IAS shall provide to the MOC a schedule for the operational acquisition of partial aperture calibration data, full aperture calibration data, and surface image data of radiometric and geometric calibration ground sites	x						
3.2.1.3.2	The IAS shall coordinate with the MOC for the acquisition of additional ETM+ imagery required for calibration and image assessment.	x						
3.2.1.3.3	The IAS shall interface with the MOC to coordinate the transfer of problem reports, and calibration parameter files.	x						
3.2.1.3.4	The IAS shall send problem reports to the MOC.	x						
3.2.1.3.5	The IAS shall electronically send calibration parameter files and calibration requests to the MOC.	x						
3.2.1.3.6	The IAS shall be capable of receiving trend reports and spacecraft status reports from the MOC.	x						
3.2.1.3.7	The IAS shall be capable of receiving FDF generated definitive ephemeris from the MOC.	x						
3.2.1.4.1	The IAS shall send problem reports and summary reports to the Mission Management Office.	x						
3.2.2 Functional Requirements								
3.2.2.1 Radiometric Calibration								
3.2.2.1.1	The IAS shall be able to utilize data from the internal calibrator in the calibration of the radiometric response of each ETM+ detector.			x				
3.2.2.1.2	The IAS shall be able to calibrate the radiometric response of each ETM+ detector, except band 6, using data from the partial aperture solar calibrator.	x	x	x		x		
3.2.2.1.3	The IAS shall be able to calibrate the radiometric response of each ETM+ detector, except band 6, using data from the full aperture solar calibrator.	x	x	x		x		

3.2.2.1.4	The IAS shall be able to calibrate the radiometric response of each ETM+ detector given Level OR data of a ground calibration site and corresponding at-aperture spectral radiance values.			x				
3.2.2.1.5	The IAS shall be able to calibrate the radiometric response of each ETM+ detector using level OR data from pre-ship and pre-launch calibration sources and auxiliary calibration source data.			x				
3.2.2.1.6	The IAS shall have the capability of assessing the short and long-term stability of the on-board calibration sources which include the full aperture solar calibrator, partial aperture solar calibrator, and the internal calibrators.			x				x
3.2.2.1.7	The IAS shall be able to integrate the results of the various calibration processes into an optimal estimate of radiometric calibration of each detector (except band 6) and provide new calibration parameters.	x	x	x		x		
3.2.2.1.8	The IAS shall be capable of generating radiometric calibration updates.	x		x				
3.2.2.1.9	The IAS shall be able to transfer the calibration of each detector to the internal calibrator.			x				
3.2.2.2 Geometric Calibration								
3.2.2.2.1	The IAS shall be capable of determining the misalignment between the satellite navigational base reference and the ETM+ payload line-of-sight.	x	x		x			
3.2.2.2.2	The IAS shall be capable of determining band to band registration parameters.	x	x				x	
3.2.2.2.3	The IAS shall be capable of characterizing and updating along and across scan parameters (i.e. scan mirror profiles, scan corrected mirror profile, detector offsets, detector delays).	x	x		x		x	
3.2.2.2.4	The IAS shall be capable of generating geometric calibration updates.	x	x		x			

3.2.2.3 Level 1 Processing								
3.2.2.3.1	The IAS shall be capable of processing PCD data.	x	x					x
3.2.2.3.2	The IAS shall be capable of processing ETM+ Level OR products to produce radiometrically corrected Level 1R image data.	x	x	x		x		
3.2.2.3.3	The IAS shall be capable of creating systematically corrected ETM+ Level 1G imagery from level OR products.	x	x					
3.2.2.3.4	The IAS shall be capable of creating precision corrected ETM+ Level 1G imagery from level OR products and ground control points.	x	x					
3.2.2.3.5	The IAS shall be capable of creating terrain corrected ETM+ Level 1G imagery from level OR products, ground control points, and elevation data.	x	x					
3.2.2.3.6	The IAS shall be capable of performing image to image registration.	x	x				x	
3.2.2.3.7	The IAS shall be capable of incorporating IAS generated calibration coefficient updates to generate Level 1 data.		x	x				
3.2.2.3.8	The IAS shall support nearest neighbor, cubic convolution, and MTF compensation resampling.		x					
3.2.2.3.9	The IAS shall have the capability to produce a 1G product with a grid cell size that is continuously variable from 15 to 60 meters.		x					
3.2.2.3.10	The IAS shall have the capability to map project 1G using the Space Oblique Mercator, Universal Transverse Mercator, Lambert Conformal Conic, Transverse Mercator, Oblique Mercator, and Polyconic coordinate reference systems.		x					
3.2.2.3.11	The IAS shall have the capability to create a 1G image oriented to nominal path or north-up		x					
3.2.2.3.12	The IAS shall be capable of receiving and archiving GCPs and GCP chips	x						

3.2.2.3.1 3	The IAS shall be capable of compensating for inoperable detectors during level 1R and 1G processing.		x	x		x		
3.2.2.3.1 4	The IAS shall be capable of compensating for image artifacts including but not limited to streaking, banding, and pan coherent noise during level 1R and 1G processing		x	x		x		
3.2.2.3.1 5	The IAS shall be capable of processing to Level 1R and 1G both ascending and descending pass ETM+ Level OR data	x	x					
3.2.2.3.1 6	The IAS shall be capable of processing non-nominal data (e.g. backwards time jumps, data gaps).	x	x					
3.2.2.4 Performance Evaluation								
3.2.2.4.1	The IAS shall evaluate the on-orbit operability of ETM+ detectors.	x				x		x
3.2.2.4.2	The IAS shall be able to evaluate the absolute radiometric accuracy of ETM+ Level OR, 1R and 1G data.	x				x		x
3.2.2.4.3	The IAS shall be able to assess identified ETM+ radiometric image artifacts including but not limited to streaking, banding, correlated and coherent noise, scan line droop, and bright target recovery response	x				x		x
3.2.2.4.4	The IAS shall be able to evaluate the MTF of each ETM+ detector.	x				x		x
3.2.2.4.5	The IAS shall be able to evaluate the signal to noise ratio of each ETM+ detector, utilizing pre-launch and on-orbit image data.	x				x		x
3.2.2.4.6	The IAS shall be capable of evaluating the on-orbit radiometric response of each ETM+ detector with respect to dynamic range.	x				x		x
3.2.2.4.7	The IAS shall be capable of evaluating the on-orbit radiometric response of each ETM+ detector excluding band 6 with respect to linearity (TBD)	x				x		x

3.2.2.4.8	The IAS shall be able to evaluate the geodetic accuracy of ETM+ Level 1G image data.	x	x				x	x
3.2.2.4.9	The IAS shall be able to evaluate the internal geometric accuracy of ETM+ Level 1G image data.	x	x				x	x
3.2.2.4.10	The IAS shall be able to evaluate the band to band registration accuracy of ETM+ imagery.	x	x				x	
3.2.2.4.11	The IAS shall be able to evaluate the image to image registration accuracy of ETM+ data.						x	
3.2.2.4.12	The IAS shall be able to evaluate the quality of level OR products. Quality checks will include but not be limited to those listed in Table 3.2.2.4-1.	x						x
3.2.2.4.13	The IAS shall be capable of performing a trend analysis over any desired time interval for each selected evaluation activity.	x	x	x	x	x	x	x
3.2.2.4.14	The IAS shall be capable of performing (and/or supporting) other anomaly, assessment, resolution, and reporting.					x	x	x
3.2.2.4.15	The IAS shall provide the capability to visually inspect image data.							x
3.2.2.4.16	The IAS shall provide a capability that allows an image analyst to monitor assessment processes and results.							x
3.2.2.4.17	The IAS shall have the capability to review output data including but not limited to calibration reports and updates.	x						x
<u>3.2.2.5 Incorporation of New Algorithms</u>								
3.2.2.5.1	The IAS shall have the capability to acquire, develop, test, and add new algorithms and software to improve the radiometric and geometric properties of ETM+ data and their assessment without impacting IAS operations.	x	x	x	x	x	x	x

3.2.2.5.2	The IAS shall support the development of algorithms to remove image artifacts and detector outages from Level 1R and 1G data.		x	x		x		
3.2.2.5.3	The IAS shall have the capability to incorporate new algorithms into the operational system.							
3.2.2.5.4	The IAS shall maintain configuration control of all algorithms, databases, software, and hardware used in operations.							
3.2.2.6 Control Processes and Manage Data								
3.2.2.6.1	The IAS shall be capable of executing a set of processes defined as procedures	x						
3.2.2.6.2	The IAS shall be capable of archiving all software and databases used in operations	x						
3.2.2.6.3	The IAS shall be capable of storing selected data, parameters, reports, and documents.	x						
3.2.2.6.4	The IAS shall have the ability to monitor and control processes and procedures.	x						
3.2.2.6.5	The IAS shall be capable of storing selected GCPs, GCP chips, and associated metadata.	x						
3.2.2.6.6	The IAS shall be capable of receiving and storing selected DEMs.	x						
3.2.2.6.7	The IAS shall be capable of archiving selected online data, parameters, and ancillary data.	x						
3.2.2.6.8	The IAS shall be capable of receiving and storing solar spectral and broadband radiance data from external sources.	x						
3.2.2.6.9	The IAS shall be capable of receiving and storing sun radiance data from external sources	x						
3.2.2.6.10	The IAS shall be capable of receiving and storing cross calibration data from other sensors.	x						

3.2.2.6.1 1	The IAS shall archive selected pre-launch data including but not limited to sensor engineering, ETM+ image data, alignment matrices, calibration measurements, mirror scan profiles, FASC BRDF, relative spectral sub-system response on a detector by detector basis, and required characterization data for performing in-flight calibrations	x						
3.2.2.7 Report and Summaries								
3.2.2.7.1	The IAS shall generate calibration, data quality assessment, and problems reports for the various interfaces.	x						x
3.2.2.7.2	The IAS shall be capable of generating metadata for all reports sent to the EDC-DAAC.	x						x
3.2.2.7.3	The IAS shall generate annual reports that document calibration coefficient and performance analysis trends.	x						x
3.2.2.7.4	The IAS shall generate reports of anomaly detection analyses as they appear.							x
3.2.2.7.5	The IAS shall generate processing summaries after each IAS activity.	x						x
3.2.3 Performance Requirements								
Accuracy								
3.2.3.1	The IAS shall be capable of calibrating the radiometric response (absolute spectral radiance) of each operable ETM+ detector to an accuracy of 5%, 1 sigma, providing all inputs are within specification.			x		x		
3.2.3.2	The IAS shall be capable of calibrating the relative radiometric response such that the ratio of ETM+ equivalent at-aperture radiances between any combination of two spectral bands, excluding band 6, shall vary less than 2%, 1 sigma, over a 7 day period when exposed to a spectrally constant source.	x		x		x		x

3.2.3.3	The IAS shall contribute no greater than .7% uncertainty to absolute radiometric accuracy during the generation of level 1R and 1G data.		x			x		x
3.2.3.4	The IAS shall be able to create systematic imagery to a geodetic accuracy of 250 meters, 1 sigma, providing all inputs are within specification. Performance applies to along-track and cross-track directions, and is referenced to a nadir-viewing geometry.	x	x				x	
3.2.3.5	The Level 1 Processor shall contribute circular errors no greater than 1.8 m, 1 sigma, in the production of systematically corrected ETM+ Level 1G imagery. This error is referenced to a nadir viewing geometry and excludes the effect of terrain correction.	x	x				x	
3.2.3.6	The IAS shall provide the capability to register pixels from a band to the corresponding pixels of the other bands in a common scene to an accuracy of 0.28 sensor GSD, .9p, in along-track and cross-track directions providing all inputs are within specification. The accuracy is relative to the largest sensor GSD of the registered bands.		x				x	
3.2.3.7	The Level 1 Processor shall contribute error no greater than .11 multispectral sensor GSD, .9p, along-track, and .24 multispectral sensor GSD, .9p, cross-track in the assessment of band-to-band registration.		x				x	
3.2.3.8	The IAS shall provide the capability to perform image to image registration to an accuracy of 0.4 multispectral sensor GSD, .9p, in the along-track and cross-track directions providing all inputs are within specification.		x				x	

3.2.3.9	The Level 1 Processor shall contribute circular errors no greater than 3.6 m, 1 sigma, during image to image registration correction of ETM+ Level 1G data. Error is referenced to a nadir viewing geometry and excludes the effect of terrain correction		x				x	
3.2.3.10	The IAS shall be capable of estimating the field angles to an accuracy of .18 arcsec, 1 sigma.	x	x		x		x	
3.2.3.11	The IAS shall be capable of digitally correlating common features in separate bands of the same image or same bands of separate images to an accuracy of 0.1 pixel, .9p.		x				x	
3.2.3.12	The IAS shall be capable of estimating the alignment of the ETM+ line-of-sight to the satellite navigation base reference to an accuracy of 24 arcsec, 1 sigma, in all axes.				x		x	
3.2.3.13	Deleted							
Throughput								
3.2.3.14	The IAS shall be capable of generating the equivalent of up to 10 ETM+ Level 1R or 10 1G systematically precision corrected scenes in an 8 hour day over the life of the mission.	x	x			x		
3.2.3.15	The IAS shall be capable of receiving and storing up to 10 GB per day of data from the EDC-DAAC.	x						
3.2.3.16	The IAS shall be capable of archiving a total of 20,000 Landsat-7 Level OR equivalent scenes over the life of the mission.	x						
3.2.3.17	The IAS shall generate monthly reports that document the quality of OR data and OR products retrieved from the EDC-DAAC.							x
3.2.3.18	The IAS shall provide regular calibration and performance updates to the EDC-DAAC and other interfaces on a quarterly basis.	x						x

3.2.3.19	The IAS shall provide an annual Landsat-7 image quality report.							x
3.2.3.20	The IAS shall have an online data storage capacity of 100 GB (TBR)	x						
3.2.3.21	The IAS shall be capable of storing GCP data (points, chips, metadata) of at least 68 MB.	x						
3.2.3.22	The IAS shall capable of archiving 20 GB of elevation data.	x						
3.2.4 Operational Requirements								
3.2.4.1	The IAS shall be staffed with an operator, two image analysts, software maintenance personnel, and an IAS manager (TBR).							
3.2.4.2	The IAS shall support end-to-end testing at least 12 (TBR) months prior to launch.							
3.2.4.3	The IAS shall be capable of supporting full operations at launch -6 months							
3.2.4.4	The IAS shall support mission operations for a minimum of 5 years following in-orbit check-out (IOC).							
3.2.4.5	The IAS shall operate two shifts for seven days a week during IOC plus 48 days (TBR)							
3.2.4.6	The IAS shall be staffed during prime shift post IOC plus 48 days (TBR).							
3.2.4.7	The IAS shall ensure backup of all online data and operations software	x						
3.2.4.8	The IAS shall perform calibrations, assessments and evaluations with frequencies specified in Tables 3.2.4-1 and 3.2.4-2.	x	x	x	x	x	x	x
3.2.4.9	The IAS shall have the capability to maintain and upgrade all operational software							
3.2.4.10	The IAS shall be capable of supporting training without impacting daily work loads.							
3.2.4.11	The IAS shall provide an Operational Availability of 0.85 (TBR) or better for all processing functions .							

3.2.4.12	The IAS shall support a mean time to restore (MTTR) capability of 12 (TBR) hours or better.							
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6.4.2 IAS Subsystems to IAS Element Specifications Allocation

6.4.2.1: Control Processes and Manage Data Requirements Map

- 3.2.1.1.1 The IAS shall interface with the EDC-DAAC for purposes of searching for and ordering of data from the Landsat 7 archive.
- 3.2.1.1.2 The IAS shall receive Level OR Data and Level OR Products and associated ancillary/metadata from the EDC-DAAC.
- 3.2.1.1.3 The IAS shall interface with the EDC-DAAC to coordinate the transfer of calibration parameter files and IAS generated reports.
- 3.2.1.1.4 The IAS shall electronically send calibration parameter files, IAS generated reports, and their respective metadata to the EDC-DAAC.
- 3.2.1.2.1 The IAS shall interface with the LPS to coordinate the transfer of calibration parameter files and reprocessing requests.
- 3.2.1.2.2 The IAS shall send reprocessing requests to the LPS.
- 3.2.1.2.3 The IAS shall receive disposition of reprocessing requests from the LPS.
- 3.2.1.2.4 The IAS shall send calibration parameter files to the LPS.
- 3.2.1.3.1 The IAS shall provide to the MOC a schedule for the operational acquisition of partial aperture calibration data, full aperture calibration data, and surface image data of radiometric and geometric calibration ground sites.
- 3.2.1.3.2 The IAS shall coordinate with the MOC for the acquisition of additional ETM+ imagery required for calibration and image assessment.
- 3.2.1.3.3 The IAS shall interface with the MOC to coordinate the transfer of problem reports, and calibration parameter files.

- 3.2.1.3.4 The IAS shall send problem reports to the MOC
- 3.2.1.3.5 The IAS shall electronically send calibration parameter files and calibration request to the MOC.
- 3.2.1.3.6 The IAS shall be capable of receiving trend reports and spacecraft status reports from the MOC.
- 3.2.1.3.7 The IAS shall be capable of receiving FDF generated definitive ephemeris from the MOC.
- 3.2.1.4.1 The IAS shall send problem reports and summary reports to the Mission Management Office.
- 3.2.2.1.8 The IAS shall be capable of generating radiometric calibration updates.
- 3.2.2.2.4 The IAS shall be capable of generating geometric calibration updates and their associated metadata.
- 3.2.2.3.1 The IAS shall be capable of processing PCD data.
- 3.2.2.3.2 The IAS shall be capable of processing ETM+ Level OR products to produce radiometrically corrected Level 1R image data.
- 3.2.2.3.3 The IAS shall be capable of creating systematically corrected ETM+ Level 1G imagery from level OR products.
- 3.2.2.3.4 The IAS shall be capable of creating precision corrected ETM+ Level 1G imagery from level OR products and ground control points.
- 3.2.2.3.5 The IAS shall be capable of creating terrain corrected ETM+ Level 1G imagery from level OR products, ground control points, and elevation data.
- 3.2.2.3.6 The IAS shall be capable of performing image to image registration.
- 3.2.2.3.12 The IAS shall be capable of receiving and archiving GCPs and GCP chips.

- 3.2.2.4.16 The IAS shall provide a capability that allows an image analyst to monitor assessment processes and results.
- 3.2.2.4.17 The IAS shall have the capability to review output data including but not limited to calibration reports and updates.
- 3.2.2.6.1 The IAS shall be capable of executing a set of processes defined as procedures.
- 3.2.2.6.2 The IAS shall be capable of archiving all software and databases used in operations.
- 3.2.2.6.3 The IAS shall be capable of storing selected data, parameters, reports, and documents.
- 3.2.2.6.4 The IAS shall have the ability to monitor and control processes and procedures.
- 3.2.2.6.5 The IAS shall be capable of storing selected GCPs, GCP chips, and associated metadata.
- 3.2.2.6.6 The IAS shall be capable of receiving and storing selected DEMs.
- 3.2.2.6.7 The IAS shall be capable of archiving selected online data, parameters, and ancillary data.
- 3.2.2.6.8 The IAS shall be capable of receiving and storing solar spectral and broadband radiance data from external sources.
- 3.2.2.6.9 The IAS shall be capable of receiving and storing sun radiance data from external sources.
- 3.2.2.6.10 The IAS shall be capable of receiving and storing cross calibration data from other sensors.
- 3.2.2.6.11 The IAS shall archive selected pre-launch data including but not limited to sensor engineering, ETM+ image data, alignment matrices, calibration measurements, mirror scan profiles, FASC BRDF, relative spectral sub-system response on a detector by detector basis, and required characterization data for performing in-flight calibrations.

- 3.2.2.7.1 The IAS shall generate calibration, data quality assessment, and problems reports for the various interfaces.
- 3.2.2.7.2 The IAS shall be capable of generating metadata for all reports sent to the EDC-DAAC.
- 3.2.2.7.3 The IAS shall generate annual reports that document calibration coefficient and performance analysis trends.
- 3.2.2.7.4 The IAS shall generate reports of anomaly detection analyses as they appear.
- 3.2.2.7.5 The IAS shall generate processing summaries after each IAS activity.
- 3.2.3.17 The IAS shall generate monthly reports that document the quality of OR data and OR products retrieved from the EDC-DAAC.
- 3.2.4.18 The IAS shall provide regular calibration and performance updates to the EDC-DAAC and other interfaces on a quarterly basis.
- 3.2.4.19 The IAS shall provide an annual Landsat-7 image quality report.
- 3.2.3.20 The IAS shall have an online data storage capacity of 100 GB (TBR).
- 3.2.3.21 The IAS shall be capable of storing GCP data (points, chips, metadata) of at least 68 MB.
- 3.2.3.22 The IAS shall be capable of archiving 20 GB of elevation data.
- 3.2.4.3 The IAS shall be capable of supporting full operations at launch -6 months.
- 3.2.4.7 The IAS shall ensure backup of all online data and operations software.

6.4.2.2: Process to Level 1 Requirements Map

- 3.2.2.2.1 The IAS shall be capable of determining the misalignment between the satellite navigational base reference and the ETM+ payload line-of-sight.
- 3.2.2.2.2 The IAS shall be capable of determining band to band registration parameters.
- 3.2.2.2.3 The IAS shall be capable of characterizing and updating along and across scan parameters (i.e. scan mirror profiles, scan corrected mirror profile, detector offsets, detector delays).
- 3.2.2.2.4 The IAS shall be capable of generating geometric calibration updates and their associated metadata.
- 3.2.2.3.1 The IAS shall be capable of processing PCD data.
- 3.2.2.3.2 The IAS shall be capable of processing ETM+ Level OR products to produce radiometrically corrected Level 1R image data.
- 3.2.2.3.3 The IAS shall be capable of creating systematically corrected ETM+ Level 1G imagery from level OR products.
- 3.2.2.3.4 The IAS shall be capable of creating precision corrected ETM+ Level 1G imagery from level OR products and ground control points.
- 3.2.2.3.5 The IAS shall be capable of creating terrain corrected ETM+ Level 1G imagery from level OR products, ground control points, and elevation data.
- 3.2.2.3.6 The IAS shall be capable of performing image to image registration.
- 3.2.2.3.7 The IAS shall be capable of incorporating IAS generated calibration coefficient updates to generate Level 1 data.
- 3.2.2.3.8 The IAS shall support nearest neighbor, cubic convolution, and MTF compensation resampling.
- 3.2.2.3.9 The IAS shall have the capability to produce a 1G product with a grid cell size that is continuously variable from 15 to 60 meters.

- 3.2.2.3.10 The IAS shall have the capability to map project 1G using the Space Oblique Mercator, Universal Transverse Mercator, Lambert Conformal Conic, Transverse Mercator, Oblique Mercator, and Polyconic coordinate reference systems.
- 3.2.2.3.11 The IAS shall have the capability to create a 1G image oriented to nominal path or north-up.
- 3.2.2.3.13 The IAS shall be capable of compensating for inoperable detectors during level 1R and 1G processing.
- 3.2.2.3.14 The IAS shall be capable of compensating for image artifacts including but not limited to streaking, banding, and pan coherent noise during level 1R and 1G processing.
- 3.2.2.3.15 The IAS shall be capable of processing to Level 1R and 1G both ascending and descending pass ETM+ Level OR data.
- 3.2.2.3.16 The IAS shall be capable of processing non-nominal data (e.g. backwards time jumps, data gaps).
- 3.2.2.4.2 The IAS shall be able to evaluate the absolute radiometric accuracy of ETM+ Level OR, 1R and 1G data.
- 3.2.2.4.15 The IAS shall provide the capability to visually inspect image data.
- 3.2.2.5.1 The IAS shall have the capability to acquire, develop, test, and add new algorithms and software to improve the radiometric and geometric properties of ETM+ data and their assessment without impacting IAS operations.
- 3.2.2.5.2 The IAS shall support the development of algorithms to remove image artifacts and detector outages from Level 1R and 1G data.
- 3.2.3.3 The IAS shall contribute no greater than .7% uncertainty to absolute radiometric accuracy during the generation of level 1R and 1G data.
- 3.2.3.4 The IAS shall be able to create systematic imagery to a geodetic accuracy of 250 meters, 1 sigma, providing all inputs are within specification. Performance applies to along-track

and cross-track directions, and is referenced to a nadir-viewing geometry.

- 3.2.3.5 The Level 1 Processor shall contribute circular errors no greater than 1.8 m, 1 sigma, in the production of systematically corrected ETM+ Level 1G imagery. This error is referenced to a nadir viewing geometry and excludes the effect of terrain correction.
- 3.2.3.7 The Level 1 Processor shall contribute error no greater than .11 multispectral sensor GSD, .9p, along-track, and .24 multispectral sensor GSD, .9p, cross-track in the assessment of band-to-band registration.
- 3.2.3.9 The Level 1 Processor shall contribute circular errors no greater than 3.6 m, 1 sigma, during image to image registration correction of ETM+ Level 1G data. Error is referenced to a nadir viewing geometry and excludes the effect of terrain correction.
- 3.2.3.11 The IAS shall be capable of digitally correlating common features in separate bands of the same image or same bands of separate images to an accuracy of 0.1 pixel, .9p.
- 3.2.3.14 The IAS shall be capable of generating the equivalent of up to 10 ETM+ Level 1R or 10 1G **systematically** precision corrected scenes in an 8 hour day over the life of the mission.
- 3.2.4.3 The IAS shall be capable of supporting full operations at launch -6 months.

6.4.2.3: Perform Radiometric Calibration Requirements Map

- 3.2.2.1.1 The IAS shall be able to utilize data from the internal calibrator in the calibration of the radiometric response of each ETM+ detector.
- 3.2.2.1.2 The IAS shall be able to calibrate the radiometric response of each ETM+ detector, except band 6, using data from the partial aperture solar calibrator.
- 3.2.2.1.3 The IAS shall be able to calibrate the radiometric response of each ETM+ detector, except band 6, using data from the full aperture solar calibrator.
- 3.2.2.1.4 The IAS shall be able to calibrate the radiometric response of each ETM+ detector given Level OR data of a ground calibration site and corresponding at-aperture spectral radiance values.
- 3.2.2.1.5 The IAS shall be able to calibrate the radiometric response of each ETM+ detector using level OR data from pre-ship and pre-launch calibration sources and auxiliary calibration source data.
- 3.2.2.1.6 The IAS shall have the capability of assessing the short and long-term stability of the on-board calibration sources which include the full aperture solar calibrator, partial aperture solar calibrator, and the internal calibrators.
- 3.2.2.1.7 The IAS shall be able to integrate the results of the various calibration processes into an optimal estimate of radiometric calibration of each detector (except band 6) and provide new calibration parameters.
- 3.2.2.1.8 The IAS shall be capable of generating radiometric calibration updates.
- 3.2.2.1.9 The IAS shall be able to transfer the calibration of each detector to the internal calibrator.
- 3.2.2.3.2 The IAS shall be capable of processing ETM+ Level OR products to produce radiometrically corrected Level 1R image data.
- 3.2.2.3.7 The IAS shall be capable of incorporating IAS generated calibration coefficient updates to generate Level 1 data.

- 3.2.2.3.13 The IAS shall be capable of compensating for inoperable detectors during level 1R and 1G processing.
- 3.2.2.3.14 The IAS shall be capable of compensating for image artifacts including but not limited to streaking, banding, and pan coherent noise during level 1R and 1G processing.
- 3.2.2.5.1 The IAS shall have the capability to acquire, develop, test, and add new algorithms and software to improve the radiometric and geometric properties of ETM+ data and their assessment without impacting IAS operations.
- 3.2.2.5.2 The IAS shall support the development of algorithms to remove image artifacts and detector outages from Level 1R and 1G data.
- 3.2.3.1 The IAS shall be capable of calibrating the radiometric response (absolute spectral radiance) of each operable ETM+ detector to an accuracy of 5%, 1 sigma, providing all inputs are within specification.
- 3.2.3.2 The IAS shall be capable of calibrating the relative radiometric response such that the ratio of ETM+ equivalent at-aperture radiances between any combination of two spectral bands, excluding band 6, shall vary less than 2%, 1 sigma, over a 7 day period when exposed to a spectrally constant source.
- 3.2.4.3 The IAS shall be capable of supporting full operations at launch -6 months.
- 3.2.4.8 The IAS shall perform calibrations, assessments and evaluations with frequencies specified in Tables 3.2.4-1 and 3.2.4-2.

6.4.2.4: Perform Geometric Calibration Requirements Map

- 3.2.2.2.1 The IAS shall be capable of determining the misalignment between the satellite navigational base reference and the ETM+ payload line-of-sight.
- 3.2.2.2.2 The IAS shall be capable of determining band to band registration parameters.
- 3.2.2.2.3 The IAS shall be capable of characterizing and updating along and across scan parameters (i.e. scan mirror profiles, scan corrected mirror profile, detector offsets, detector delays).
- 3.2.2.2.4 The IAS shall be capable of generating geometric calibration updates and their associated metadata.
- 3.2.2.5.1 The IAS shall have the capability to acquire, develop, test, and add new algorithms and software to improve the radiometric and geometric properties of ETM+ data and their assessment without impacting IAS operations.
- 3.2.3.4 The IAS shall be able to create systematic imagery to a geodetic accuracy of 250 meters, 1 sigma, providing all inputs are within specification. Performance applies to along-track and cross-track directions, and is referenced to a nadir-viewing geometry.
- 3.2.3.10 The IAS shall be capable of estimating the field angles to an accuracy of .18 arcsec, 1 sigma.
- 3.2.3.12 The IAS shall be capable of estimating the alignment of the ETM+ line-of-sight to the satellite navigation base reference to an accuracy of 24 arcsec, 1 sigma, in all axes.
- 3.2.4.3 The IAS shall be capable of supporting full operations at launch -6 months.
- 3.2.4.8 The IAS shall perform calibrations, assessments and evaluations with frequencies specified in Tables 3.2.4-1 and 3.2.4-2.

6.4.2.5: Characterize Radiometry Requirements Map

- 3.2.2.3.2 The IAS shall be capable of processing ETM+ Level OR products to produce radiometrically corrected Level 1R image data.
- 3.2.2.3.7 The IAS shall be capable of incorporating IAS generated calibration coefficient updates to generate Level 1 data
- 3.2.2.3.13 The IAS shall be capable of compensating for inoperable detectors during level 1R and 1G processing.
- 3.2.2.3.14 The IAS shall be capable of compensating for image artifacts including but not limited to streaking, banding, and pan coherent noise during level 1R and 1G processing.
- 3.2.2.4.1 The IAS shall evaluate the on-orbit operability of ETM+ detectors.
- 3.2.2.4.2 The IAS shall be able to evaluate the absolute radiometric accuracy of ETM+ Level OR, 1R and 1G data.
- 3.2.2.4.3 The IAS shall be able to assess identified ETM+ radiometric image artifacts including but not limited to streaking, banding, correlated and coherent noise, scan line droop, and bright target recovery response.
- 3.2.2.4.4 The IAS shall be able to evaluate the MTF of each ETM+ detector.
- 3.2.2.4.5 The IAS shall be able to evaluate the signal to noise ratio of each ETM+ detector, utilizing pre-launch and on-orbit image data.
- 3.2.2.4.6 The IAS shall be capable of evaluating the on-orbit radiometric response of each ETM+ detector with respect to dynamic range.
- 3.2.2.4.7 The IAS shall be capable of evaluating the on-orbit radiometric response of each ETM+ detector excluding band 6 with respect to linearity (TBD).
- 3.2.2.4.12 The IAS shall be able to evaluate the quality of level OR products. Quality checks will include but not be limited to those listed in Table 3.2.2.4-1.

- 3.2.2.4.14 The IAS shall be capable of performing (and/or supporting) other anomaly, assessment, resolution, and reporting.
- 3.2.2.4.15 The IAS shall provide the capability to visually inspect image data.
- 3.2.2.5.1 The IAS shall have the capability to acquire, develop, test, and add new algorithms and software to improve the radiometric and geometric properties of ETM+ data and their assessment without impacting IAS operations.
- 3.2.2.5.2 The IAS shall support the development of algorithms to remove image artifacts and detector outages from Level 1R and 1G data.
- 3.2.3.1 The IAS shall be capable of calibrating the radiometric response (absolute spectral radiance) of each operable ETM+ detector to an accuracy of 5%, 1 sigma, providing all inputs are within specification.
- 3.2.3.2 The IAS shall be capable of calibrating the relative radiometric response such that the ratio of ETM+ equivalent at-aperture radiances between any combination of two spectral bands, excluding band 6, shall vary less than 2%, 1 sigma, over a 7 day period when exposed to a spectrally constant source.
- 3.2.3.3 The IAS shall contribute no greater than .7% uncertainty to absolute radiometric accuracy during the generation of level 1R and 1G data.
- 3.2.4.3 The IAS shall be capable of supporting full operations at launch -6 months.

6.4.2.6: Characterize Geometry Requirements Map

- 3.2.2.4.8 The IAS shall be able to evaluate the geodetic accuracy of ETM+ Level 1G image data.
- 3.2.2.4.9 The IAS shall be able to evaluate the internal geometric accuracy of ETM+ Level 1G image data.
- 3.2.2.4.10 The IAS shall be able to evaluate the band to band registration accuracy of ETM+ imagery.
- 3.2.2.4.11 The IAS shall be able to evaluate the image to image registration accuracy of ETM+ data.
- 3.2.2.4.14 The IAS shall be capable of performing (and/or supporting) other anomaly, assessment, resolution, and reporting.
- 3.2.2.4.15 The IAS shall provide the capability to visually inspect image data.
- 3.2.2.5.1 The IAS shall have the capability to acquire, develop, test, and add new algorithms and software to improve the radiometric and geometric properties of ETM+ data and their assessment without impacting IAS operations.
- 3.2.3.4 The IAS shall be able to create systematic imagery to a geodetic accuracy of 250 meters, 1 sigma, providing all inputs are within specification. Performance applies to along-track and cross-track directions, and is referenced to a nadir-viewing geometry.
- 3.2.3.5 The Level 1 Processor shall contribute circular errors no greater than 1.8 m, 1 sigma, in the production of systematically corrected ETM+ Level 1G imagery. This error is referenced to a nadir viewing geometry and excludes the effect of terrain correction.
- 3.2.3.6 The IAS shall provide the capability to register pixels from a band to the corresponding pixels of the other bands in a common scene to an accuracy of 0.28 sensor GSD, .9p, in along-track and cross-track directions providing all inputs are within specification. The accuracy is relative to the largest sensor GSD of the registered bands.

- 3.2.3.7 The Level 1 Processor shall contribute error no greater than .11 multispectral sensor GSD, .9p, along-track, and .24 multispectral sensor GSD, .9p, cross-track in the assessment of band-to-band registration.
- 3.2.3.8 The IAS shall provide the capability to perform image to image registration to an accuracy of 0.4 multispectral sensor GSD, .9p, in the along-track and cross-track directions providing all inputs are within specification.
- 3.2.3.9 The Level 1 Processor shall contribute circular errors no greater than 3.6 m, 1 sigma, during image to image registration correction of ETM+ Level 1G data. Error is referenced to a nadir viewing geometry and excludes the effect of terrain correction.
- 3.2.3.10 The IAS shall be capable of estimating the field angles to an accuracy of .18 arcsec, 1 sigma.
- 3.2.3.11 The IAS shall be capable of digitally correlating common features in separate bands of the same image or same bands of separate images to an accuracy of 0.1 pixel, .9p.
- 3.2.4.3 The IAS shall be capable of supporting full operations at launch -6 months.

6.4.2.7: Evaluate Performance Requirements Map

- 3.2.2.1.6 The IAS shall have the capability of assessing the short and long-term stability of the on-board calibration sources which include the full aperture solar calibrator, partial aperture solar calibrator, and the internal calibrators.
- 3.2.2.4.13 The IAS shall be capable of performing a trend analysis over any desired time interval for each selected evaluation activity.
- 3.2.2.4.14 The IAS shall be capable of performing (and/or supporting) other anomaly, assessment, resolution, and reporting.
- 3.2.2.4.15 The IAS shall provide the capability to visually inspect image data.
- 3.2.2.4.16 The IAS shall provide a capability that allows an image analyst to monitor assessment processes and results.
- 3.2.2.4.17 The IAS shall have the capability to review output data including but not limited to calibration reports and updates.
- 3.2.2.5.1 The IAS shall have the capability to acquire, develop, test, and add new algorithms and software to improve the radiometric and geometric properties of ETM+ data and their assessment without impacting IAS operations
- 3.2.2.7.1 The IAS shall generate calibration, data quality assessment, and problems reports for the various interfaces.
- 3.2.2.7.2 The IAS shall be capable of generating metadata for all reports sent to the EDC-DAAC.
- 3.2.2.7.3 The IAS shall generate annual reports that document calibration coefficient and performance analysis trends.
- 3.2.2.7.4 The IAS shall generate reports of anomaly detection analyses as they appear.
- 3.2.3.17 The IAS shall generate monthly reports that document the quality of OR data and OR products retrieved from the EDC-DAAC.

- 3.2.4.3 The IAS shall be capable of supporting full operations at launch -6 months.
- 3.2.4.8 The IAS shall perform calibrations, assessments and evaluations with frequencies specified in Tables 3.2.4-1 and 3.2.4-2.

Bold words = proposed additions

~~Strikeout words~~ = proposed deletions